

## Introduction

Gastrointestinal nematodes and other helminths pose a significant threat to global cattle production systems, particularly in tropical and subtropical regions. All grazing animals become infected with GI nematodes during their lifetime. Infestations result in subclinical losses in productivity, reduced feed efficiency, increased morbidity and even mortality if left untreated. Effective parasite control not only means pharmaceutical interventions but also integrated management strategies that minimize resistance development.

## Know your enemy

Cattle are hosts to a wide array of worms. The most clinically and economically significant include:

### Rumen parasites

- **Flukes** (*Paramphistomum* spp.): adults attached to the rumen papillae are 5–15 mm long. This parasite follows a typical trematode life cycle, passing eggs that hatch in water and liberate miracidia that infect the intermediate host, snails. Clinical signs are diarrhea, weakness, hypoproteinemia and anemia.



### Abomasum parasites

- **Haemonchus spp. (Barber's pole worm)**: these worms need a blood meal for survival (hematophagous). Infected animals become anemic, unthrifty, and weak and they may have a bottle jaw or sternal edema if protein loss is severe. Haemonchosis does not generally lead to diarrhea.
- **Ostertagia ostertagi (brown stomach worm)**: these worms damage gastric glands leading to protein-losing gastropathy, anorexia and impaired protein digestion. Diarrhea is persistent.
- **Trichostrongylus axei**: most infections are asymptomatic. Heavy infections can cause gastrointestinal problems (abdominal pain, diarrhea, anorexia).

### Intestinal worms

- **Cooperia** typically affects young stock, often co-infected with *Ostertagia*; associated with reduced weight gain.
- **Bunostomum** is hematophagous but generally non pathogenic; however, heavy infection can induce clinical signs including anemia, intermittent diarrhea and rapid weight loss with variable hypoproteinemic edema.
- **Nematodirus spp.** are most pathogenic to young ruminants that have no acquired immunity; adult ruminants may harbor some parasites and contribute to pasture contamination, but overt disease is rare.
- **Moniezia** are tapeworms and infestation is often asymptomatic but can impair nutrient absorption in calves.
- **Toxocara vitulorum** is found in the small intestine of calves of less than 6 months old. Light to moderate infections may be tolerated without clinical signs. Heavy infections can produce diarrhea, weight loss and death.



### Liver/bile parasites

- **Fasciola hepatica and Fasciola gigantica** are trematodes and most important flukes of domestic ruminants worldwide, causing liver fluke disease (liver rot, fascioliasis) with hepatic fibrosis, anemia and compromised metabolic function. Chronic liver fluke disease is more common.



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## Diagnosis

A worm infection can be suspected based on clinical manifestations:

- Weight loss or poor weight gain
- Diarrhea or pasty feces
- Submandibular edema (“bottle jaw”), particularly in fluke infections
- Unthriftiness and poor coat condition
- Decreased milk yield or reproductive performance



Cow with liver flukes

Cow with stomach worms

However, an accurate diagnosis is essential for targeted control.

Common diagnostic methods include:

### Fecal Egg Count (FEC) and larval culture

- **Fecal Egg Counts (FEC) and Fecal Egg Count Reduction Test (FECRT)** are widely used to monitor infection levels and detect anthelmintic resistance (Kaplan & Vidyashankar, 2012).
- **Larval differentiation** helps to identify specific nematode genera (Zajac & Conboy, 2012).



### Serum pepsinogen test

- Elevated levels indicate *Ostertagia ostertagi* infection (Fox, 1997).

### Copro-antigen ELISA

- Detects *Fasciola hepatica* infections with high sensitivity (Mezo et al., 2004).

### Bulk tank milk ELISA (dairy cattle)

- Monitors herd-level exposure to *Ostertagia* and *Fasciola* (Charlier et al., 2005).

## Treatment protocols and deworming strategies

Relying solely on drugs is no longer sustainable. Studies support combining chemical treatment with pasture management, diagnostics and targeted treatment strategies.

### Anthelmintic classes and their use

The major classes of anthelmintics used in cattle differ in chemical structure, mechanism of action and resistance risk. Understanding these classes helps to guide effective parasite control and to slow down resistance development.

- **Benzimidazoles (albendazole, fenbendazole, oxfendazole):** broad-spectrum, effective against adult and some larval stages of GI nematodes and some cestodes (tapeworms); albendazole is also active against adult liver flukes. Resistance risk is high in many regions due to frequent, long-term use and is especially common in *Cooperia* and *Haemonchus* species.
- **Macrocyclic lactones** with the subgroups avermectines (ivermectin, doramectin) and milbemectins (moxidectine) are effective against adult and larval GI nematodes, lungworms, mites and lice. Injectables and pour-on forms are common. Resistance is increasing globally, especially in *Cooperia* and *Ostertagia*. Pour-on formulations may be less effective due to underdosing or grooming behaviour.
- **Salicylanilides and closely related derivatives** (closantel, oxylcozanide, nitroxinil, bithionol sulfoxide) are mainly active against liver flukes (*Fasciola hepatica*) and some blood-feeding nematodes. Not to be used for routine GI- worm control.
- **Imidazothiazoles (e.g., levamisole):** fast-acting against nematodes but narrow spectrum.
- **Amino-acetonitrile derivatives (e.g. monepantel):** represent a newer class of anthelmintics with a novel mode of action. They are particularly valuable because they maintain efficacy against parasitic nematodes that have developed resistance to other major anthelmintic classes, including benzimidazoles, levamisole, morantel, salicylanilides and macrocyclic lactones. However, resistance against monepantel has already been documented in field isolates of certain parasites in New Zealand (Vetcompendium Belgium, 2020).

### Targeted Selective Treatment (TST)

- Targeted Selective Treatment (TST) is an advanced parasite control strategy that aims to treat only individual animals showing signs of significant worm burdens rather than blanket deworming entire herds. This approach helps to delay anthelmintic resistance, reduces chemical use and maintains

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herd productivity by focusing treatment on high-risk animals (*van Wyk & Bath, 2002*). Several criteria such as body condition score, fecal egg count, milk production, eye mucous membrane colour and age can be taken in account when applying TST.

### Strategic deworming programs and Integrated Parasite Management (IPM)

Farmers' attitudes play a crucial role in the adoption of Integrated Parasite Management (IPM). Scientific interventions alone are often ineffective unless they also consider farmers' behaviours, beliefs, and practical constraints.

- **Seasonal strategic treatments:** targeting peak transmission periods enhances efficacy and farm profitability: e.g., spring and autumn treatments for *Ostertagia* in northern temperate climates (*Borgsteede, 1996*).
- **Tropical/subtropical regions:** frequent treatments are required due to high parasite burdens (*Sutherland & Leathwick, 2011*).
- **Clean/safe pastures:** grazing on pasture that is free from infective larvae – for instance, after a rest period – minimizes exposures.



- **Grazing management, pasture rotation & mixed grazing:** alternating age groups or species (cattle, sheep, horses) helps to break parasite transmission, delays resistance and reduces parasite load (*Thamsborg et al., 1999*).

### Combination therapy

- Using two anthelmintic classes simultaneously (e.g., macrocyclic lactone plus benzimidazole or levamisole) helps to preserve effectiveness, to prolong drug life and to delay resistance (*Bartley et al., 2004*).

## Preventing anthelmintic resistance

Current worm control relies on the regular administration of anthelmintic drugs. However, in a recent meta-analysis of European data aggregated since 2010, the average prevalence of anthelmintic resistance to the 3 major anthelmintic drug classes ranged between 48% and 86% (*Rose Vineer et al., 2020*). Cases of cross-resistance and multidrug resistance are increasingly reported (*Bordes et al., 2020*).

### What can you do to prevent anthelmintic resistance?

- **Regular FECRT monitoring (*Coles et al., 2006*).**  
Fecal Egg Count Reduction Tests (FECRT) helps to assess the effectiveness of anthelmintics by comparing parasite egg counts before and after treatment. Conducting these tests regularly (at least annually) allows veterinarians and farmers to detect early signs of resistance and adapt treatment protocols accordingly. This evidence-based approach helps avoid unnecessary deworming and ensures drugs are only used when they are still effective.
- **Avoid underdosing (*Prichard et al., 2007*).**  
Underdosing occurs when animals receive less than the recommended amount of anthelmintic, allowing some parasites to survive and develop resistance. To prevent this, accurate weight estimation and correct administration techniques are essential - dosing for the heaviest animal in the group is a common practice. Using properly calibrated equipment and avoiding expired or poorly stored products further supports full efficacy.
- **Quarantine and treat incoming cattle (*Kaplan, 2020*).**  
Newly introduced animals may carry resistant parasite strains, risking contamination of pasture and herd. A sound quarantine protocol includes isolating new cattle and treating them with a combination of anthelmintic classes before they join the main herd.

## Conclusion

Effective gastrointestinal parasite control in cattle requires a multifaceted approach: it combines diagnostic tools, strategic deworming and sustainable grazing practices. A good strategic parasite control enhances productivity and profitability. Furthermore, reduction in parasite burden can lower greenhouse gas emissions. The growing threat of anthelmintic resistance necessitates judicious use of treatments and adoption of targeted selective strategies. To face this resistance threat, effective communication and clear messaging to farmers on proper deworming use needs to be done by veterinarians and industry stakeholders. Cost-benefit data demonstrating the economic impact of resistance (e.g. reduced productivity, treatment failures) versus the long-term savings of sustainable practices (e.g. targeted selective treatment, fecal egg count monitoring) can drive adoption of better practices. And finally, advisory support through veterinary guidance and extension services from agricultural universities and government agencies can contribute to face the resistance threat by tailoring parasite control programs to local resistance patterns and farm-specific needs.

## References

- Bartley, D. J., et al. (2004). *Veterinary Parasitology*, 120(1-2), 125-135.
- Borgsteede, F. H. (1996). *Veterinary Quarterly*, 18(1), 7-9.
- Charlier, J., et al. (2005). *Veterinary Parasitology*, 128(3-4), 299-308.
- Coles, G. C., et al. (2006). *Veterinary Parasitology*, 136(3-4), 167-185.
- Fox, M. T. (1997). *Veterinary Parasitology*, 72(3-4), 447-453.
- Kaminsky, R., et al. (2008). *Nature*, 452(7184), 176-180.
- Kaplan, R. M. (2020). *Veterinary Clinics: Food Animal Practice*, 36(1), 17-30.
- Kaplan, R. M., & Vidyashankar, A. N. (2012). *Veterinary Parasitology*, 186(1-2), 70-78.
- Mezo, M., et al. (2004). *Veterinary Parasitology*, 123(1-2), 25-32.
- Prichard, R. K., et al. (2007). *Veterinary Parasitology*, 147(1-2), 212-223.
- Rose Vineer et al. (2020) *Parasite* 2020:27:69. doi: 10.1051/parasite/2020062. Epub 2020 Dec 4.
- Sutherland, I. A., & Leathwick, D. M. (2011). *Veterinary Parasitology*, 180(1-2), 1-9.
- Thamsborg, S. M., et al. (1999). *Veterinary Parasitology*, 85(2-3), 137-151.
- van Wyk, J. A., & Bath, G. F. (2002). *Veterinary Parasitology*, 103(4), 291-309.
- Vetcompendium, (2020). *Farmacotherapeutische info: Amino-acetonitrilderivaten*
- Zajac, A. M., & Conboy, G. A. (2012). *Veterinary Clinical Parasitology*. Wiley-Blackwell.



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